Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

THE

AMERICAN NATURALIST

VOL. XXXIV. *May, 1900.* NO. 401.

MARINE BIOLOGY AT BEAUFORT.

H. V. WILSON.

THE sandy strip of land which extends along the North Carolina coast, separating the ocean on one side from the system of sounds on the other, is interrupted at intervals. The breaks or inlets thus convert the strip into a series of long, narrow islands, known as banks. On the mainland, opposite the inlet between Shackelford and Bogue banks, is the town of Beaufort, some 350 miles south of Baltimore and 250 northeast of Charleston. The coast line here runs nearly east and west, and Beaufort is at the end of a little peninsula which juts out from the mainland toward the south, and is nearly surrounded by water. Beaufort inlet is a mile and a half in width, and it is about the same distance, in a straight line across the harbor, from the town to Fort Macon, at the extreme end of Bogue bank. The harbor occupies an area some four or five miles wide, passing to the east and west into the shallower waters of Back (opening into Core, thence into Pamlico) and Bogue sounds, respectively.

The harbor is diversified with numerous sand shoals, mud flats, salt marshes, all more or less submerged at high water;

at which time, with the centerboard up, a "sharpy" (the favorite form of sailboat, imported here from Connecticut) may be sailed in a straight line from the inlet to the town. Behind the protecting shoals the water is always quiet, so that one may go collecting in this part of the harbor in a skiff at times when the breakers are high in the inlet and running freely along the seaward edge of the shoals. The wealth of life buried in the sand shoals and mud flats is remarkable — every spadeful brings up something. Worms are of course best represented, although sea anemones, holothurians, spatangoid urchins, burrowing Crustacea, and mollusks abound. The natural absence of rocks over the bottom forces the sessile forms to make use of whatever will afford a foothold. Diopatra tubes become covered with ascidians, these with algæ, hydroids, polyzoa, and small tubicolous annelids. Algæ and sponges fasten on partially submerged shells. The oyster beds ("oyster rocks" in the local vernacular) distributed round the margin of the flats afford a home for many other attached mollusks, and for anemones and sponges, while crabs, gasteropods, nudibranchs, ophi-

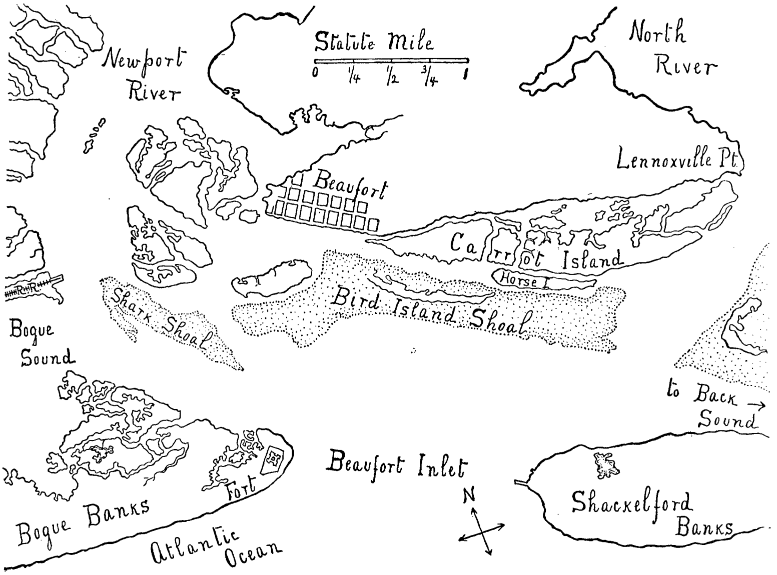

FIG. 1. — BEAUFORT HARBOR. After U. S. C. and G. S. Chart 420.

urans crawl about over the shells, and burrowing shrimps bury themselves in the mud beneath and between them.

Passing from the shoals into the deeper water of the harbor channels, the bottom is found in places to be sandy, elsewhere muddy or covered with a shelly detritus. In many places one may collect with a long-handled scraping net, working from a skiff or sailboat. But for any extensive bottom collecting the dredge and trawl, with a steam launch, are necessary. Sponges, sea feathers and fans, the beautiful Renilla, Astrangia and rarely other corals, starfish, sea urchins, sand dollars, bottom-loving shrimps, crabs, mollusks are thus taken.

The sea bottom outside the inlet, within five or six miles off the coast, has been pretty well explored with dredge and trawl. Near shore, in many places, the bottom is a sticky mud, covered with sand dollars and with abundant medusæ (Chiropsalmus). A sandy bottom is more common. The slope is gradual, the depth at five miles from the beach line being, in general, eight to nine fathoms. Many forms which are commonly seen on the beach, cast up after a storm, grow in abundance in localities within the five-mile limit. Certain crabs (Persephona, Hepatus) and starfish (Astropecten, Luidia) may especially be mentioned as conspicuous examples. The beach collecting after a southerly blow is often good. Quantities of anemones (Paractis), holothurians, compound ascidians, sponges, and stranded jellyfish are to be had.

The wharf piles at Morehead City (railroad terminus) and Beaufort, and the stone jetties on each side of the inlet deserve to be mentioned. They are among the best collecting places for attached forms — algæ, hydroids, sponges, polyzoa, anemones. Beaufort is a capital place for the study of pelagic types. A strong tide sets into the harbor, bringing a great variety of hydromedusæ, Entomostraca, pelagic worms, and a wealth of larval forms. Certain interesting Protozoa (Acanthometra, Noctiluca) are very abundant. The proximity of the gulf stream (the 100-fathom line, which marks the western bank of the stream,[1] is some fifty miles distant) frequently leads to the presence in the harbor of many forms characteristic of more southern waters. These forms often appear in large numbers, and many remain for weeks. Among such may be mentioned Physalia, Porpita (Professor Brooks mentions[1] that he has here taken nearly all the siphonophores known to occur on the Atlantic coast), the rhizostomous medusa. Stomolophus, the pelagic annelid Amphinome. On a calm evening in Beaufort harbor, with a flood tide, it is best to abandon the tow net for the dip net. The individuals are abundant enough to make the use of the latter successful, and the perfect condition in which delicate forms, such as Diphyes, Lucifer, Cuninas, Phyllosoma larvæ, etc., may thus be taken repays for the time spent.

---

[1] Agassiz. *Three Cruises of the "Blake,"* vol. i, p. 257.

Beaufort itself is a quaint and attractive town, with its wide, grassy lanes, and inclining trees (live oaks, mulberries, elms), which show plainly the direction of the prevailing wind. Viewed from the harbor the town presents a long line of white houses that edge the shore, each with its upper and lower porch, from which (more especially the upper) the harbor in turn offers a very pleasing picture. In the late afternoon, when the glare has become less intense, the picture is one that stays in the memory as a restful composition of sky and water, the latter broken here and there with green marsh islands and white shoals, with sand dunes on the banks and breakers in the inlet shutting in the view. To the eastward big reels, on which seines are wound, make a detail suggestive of the village life.

The climate is equable, but cold comes occasionally, as in last February, when the fig trees were killed to the ground. The summer temperature is not unpleasant, though one's workroom should be a large, airy one close to the shore ("on the town front," as the saying is) and open to the sea breeze. I have before me a record of temperatures made by Professor E. A. Andrews during the warmer part of the year. The observations were taken at 7 A.M and 9 P.M. daily. During May the temperature at these times was, day after day, 74°–75°. In June there were some cold days, the thermometer going down to 66°, the weather growing warmer, though, in the latter part of the month, when 78°–79° was reached. Dur-

---

[1] *Report of the President of the Johns Hopkins University*, p. 82, 1883.

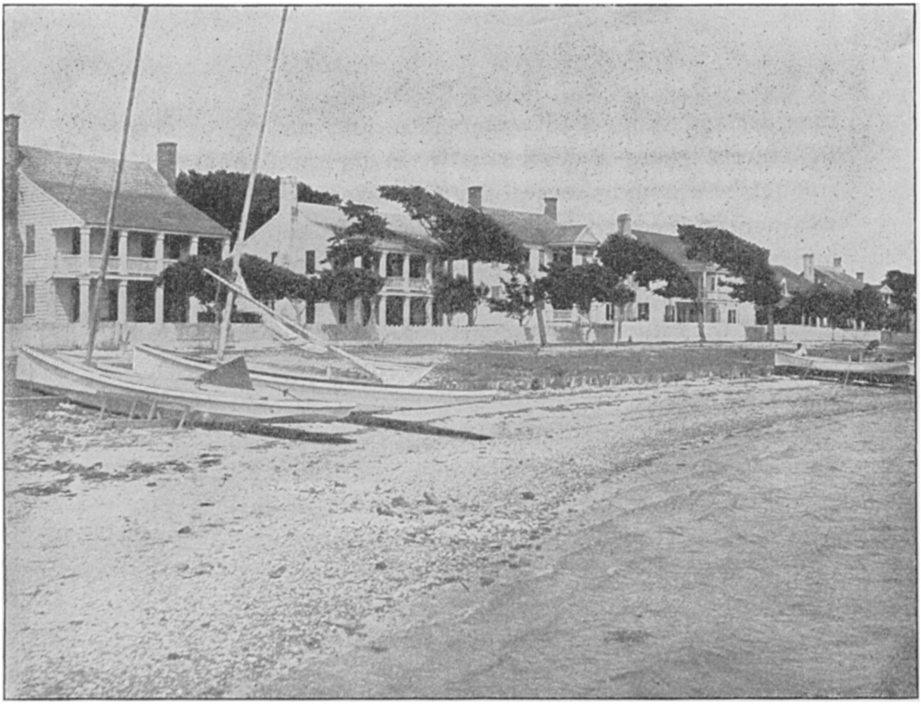

FIG. 2. — BEAUFORT — A PART OF THE "TOWN FRONT."

(The photographs made use of in the preparation of this article have been kindly loaned by Professor J. I. Hamaker.)

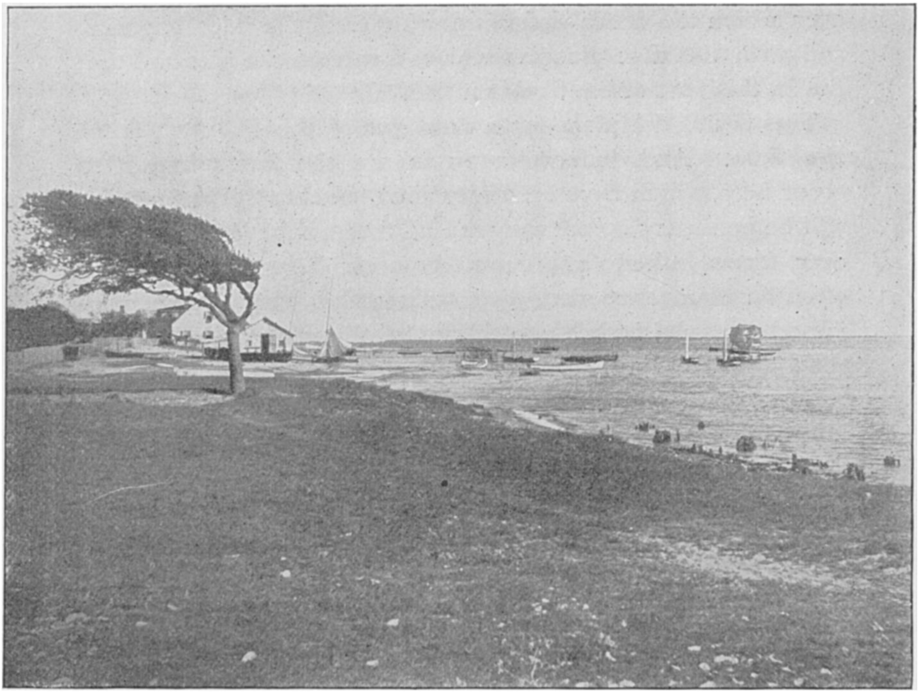

FIG. 3. — EAST END OF BEAUFORT — THE TOWN SHORE.

ing July and August the temperature on many days was 79°–81°, rarely going a degree or two above that, and much more frequently dropping several degrees below. In September the weather was cooler, the range being from 67° to 80°. At midday a very common summer temperature is 85° — only occasionally (at the times when 100°–105° is registered for so many of the cities) is it warmer. During the past season the laboratory was comfortable day and night, save once in June, when the heat of the lamps made microscopic work trying.

With proper precautions Beaufort is a healthful as well as a pleasant summering place for most people. Morehead City, across the harbor, is a well-known resort in this part of the South, and many people come also to Beaufort. The fishing, sailing, and the daily bath make the days pass agreeably for those who have nothing else to do, and contribute much to the *bien-être* of naturalists who are spending a working vacation. The ocean beach is a hard, fine one, and the surf bathing about like that of the better known Jersey coast. For the regular daily bath, however, most people prefer the harbor. With a skiff, in five minutes, one reaches a clean sand shoal, over which the ocean water is flowing from the inlet opposite, and with the first plunge becomes aware of the pleasure that lies in this part of the day's routine.

This is not the place for a catalogue of the Beaufort fauna and flora. And, indeed, many as are the forms known to occur here, which have been identified, much systematic work will be necessary before they can all properly be listed. Moreover, forms hitherto not known to occur here are discovered often in abundance with every season of work. The more important published lists of Beaufort forms are contained in the following papers:

Wm. Stimpson, M.D. "A Trip to Beaufort, N. C.," *Amer. Journ. of Sci.*, Series 2, Vol. XXIX, 1860. The paper contains lists of ascidians, mollusks, and decapod Crustacea. The Lingula of the south Atlantic coast is here first described, although McCrady, writing shortly after from Charleston (*Amer. Journ. Sci.*, Vol. XXX), mentions that it "was found more than ten years ago on our coast by the Rev. Thomas J.

Young," and that Professor Louis Agassiz, at his laboratory in Charleston harbor, had had specimens. McCrady was, I believe, the first to observe Lingula larvæ, since described in Professor Brooks's well-known paper and taken in Beaufort harbor, both by Professor Brooks and (during the past season) by Professor J. Y. Graham.

Coues and Yarrow, "Notes on the Natural History of Fort Macon, North Carolina, and Vicinity" (Nos. 1–3), *Proc. Acad. Nat. Sci. Phila.*, 1871, 1877. The vertebrate lists are much more complete than the invertebrate. There are recorded 24 mammals, 133 birds, 27 reptiles, 6 amphibia, 111 fishes. Of the invertebrates recorded the only list approaching completeness is that of the mollusks (147).

A. E. Verrill, "On Radiata from the Coast of North Carolina," *Amer. Journ. Sci.*, 1872. This paper includes lists of cœlenterates and echinoderms (Coues and Yarrow's Collection).

A. E. Verrill, "Notes on Natural History of Fort Macon" (Coues and Yarrow's Collection of Annelids), *Proc. Acad. Nat. Sci. Phila.*, 1878.

J. S. Kingsley, "On a Collection of Crustacea from Virginia, North Carolina, and Florida," etc., *Proc. Acad. Nat. Sci. Phila.*, 1879.

J. S. Kingsley, "List of Decapod Crustacea of the Atlantic Coast," whose range embraces Fort Macon, *Proc. Acad. Nat. Sci. Phila.*, 1878.

In these two papers of Kingsley's there are recorded over sixty decapods for Beaufort harbor.

Jordan and Gilbert, "Notes on Fishes of Beaufort Harbor, North Carolina," *Proc. U. S. Nat. Mus.*, 1878.

E. A. Andrews, "Report upon the Annelida polychæta of Beaufort, North Carolina," *Proc. U. S. Nat. Mus.*, Vol. XIV, 1891.

Many of the Beaufort forms have been first described by some of the older naturalists, whose collections were made farther south, along the coasts of South Carolina, Georgia, and Florida. Among such may be especially mentioned Catesby[1],

---

[1] Natural History of Carolina, Florida, and the Bahama Islands.

Bosc[1], Say[2], Le Sueur[3], Louis Agassiz[4], Gibbes[5], Stimpson[6], McCrady[7]. Other forms are constantly met with, which were first described by naturalists working farther north, on the Virginian coast (H. E. Webster)[8], on the coasts of Rhode Island and New Jersey (Leidy)[9], coast of New York (De Kay)[10], New England coast (Verrill[11], Verrill and Smith[12], Gould and Binney[13]). Other well-known memoirs, which are especially useful for systematic work at Beaufort are: Alexander Agassiz's "North American Acalephæ"[14]; Verrill's "Revision of the Polypi of the Eastern Coast of the United States"[15]; the various reports on the results of dredging, under the supervision of Alexander Agassiz, by the U. S. Coast Survey Steamer *Blake* (published in the *Memoirs* and *Bulletin* of the Museum of Comparative Zoölogy); Dall's "Catalogue of Mollusks and Brachiopods of Southeastern Coast of United States."[16]

In the *Studies from the Biological Laboratory of the Johns*

---

[1] Hist. Nat. des Crustacés ; Hist. Nat. des Vers.

[2] An Account of the Crustacea of the United States, *Journ. Acad. Nat. Sci. Phila.*, vol. i, 1817–18, *The Complete Writings of Thomas Say on the Conchology of the United States*, edited by Wm. G. Binney, 1858.

[3] Observations on Several Species of the Genus Actinia, *Journ. Acad. Nat. Sci. Phila.*, vol. i, 1817–18.

[4] Contributions to the Natural History of the United States.

[5] On the Carcinological Collections of the United States, and descriptions of new species, *Proc. Amer. Ass. Adv. Sci.*, vol. iii, 1850.

[6] Notes on North American Crustacea, *Ann. Lyceum Nat. Hist. of N. Y.*, vol. vii, 1862. On Some Remarkable Marine Invertebrates inhabiting the Shores of South Carolina, *Proc. Bost. Soc. Nat. Hist.*, vol. v, 1856.

[7] Gymnophthalmata of Charleston Harbor, *Proc. Elliott Soc. Charleston*, vol. i, 1853–58.

[8] Annelida chætopoda of the Virginian Coast.

[9] Marine Invertebrate Fauna of Coasts of Rhode Island and New Jersey, *Journ. Acad. Sci. Phila.*, vol. iii, 1855.

[10] *The Natural History of New York*, Pt. i, Zoölogy. The volume on Mollusca and Crustacea is particularly useful to the collector, because of its condensed descriptions of "extra limital" forms.

[11] *New England Annelida*, Pt. i, 1881.

[12] *Report on Invertebrate Animals of Vineyard Sound*, 1873.

[13] *Report on the Invertebrata of Massachusetts*, 2d ed.

[14] *Illust. Cat. of Mus. of Comp. Zoölogy*, 1865.

[15] *Mem. Bost. Soc. Nat. Hist.*, vol. 1, 1866–69.

[16] *Bull. U. S. Nat. Mus.*, *No. 37*, 1889.

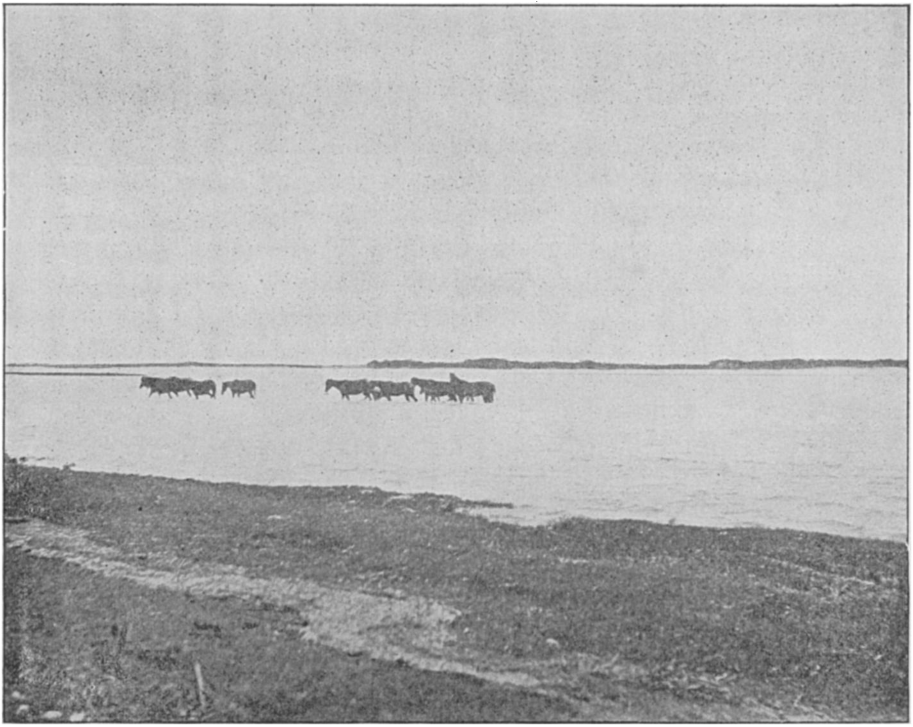

FIG. 4. — TO THE EAST OF BEAUFORT — SHACKELFORD BANK IN THE DISTANCE.

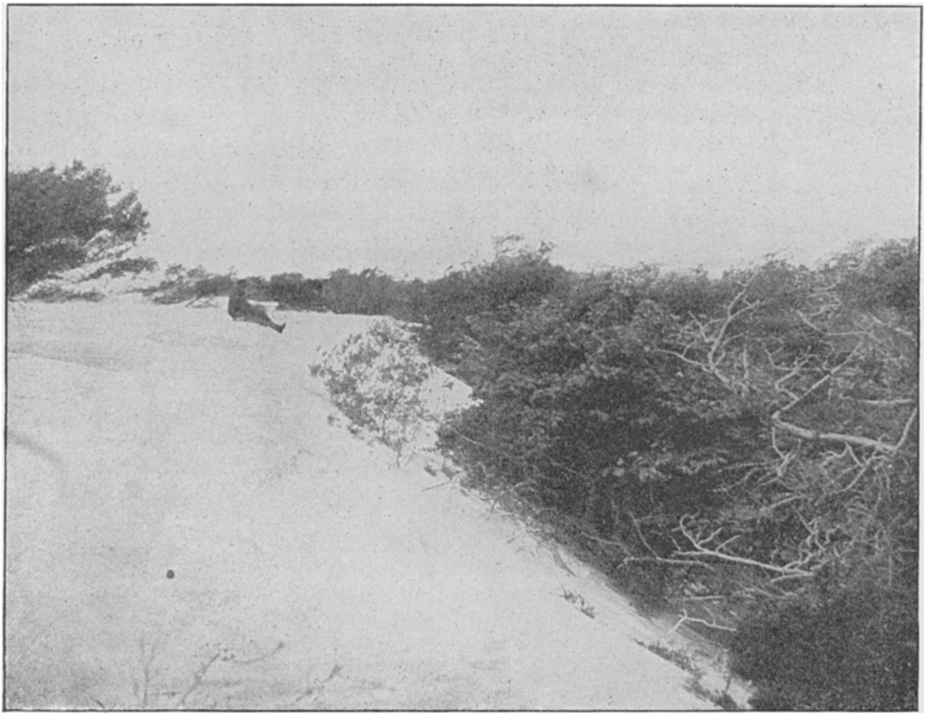

FIG. 5. — SAND DUNE ON SHACKELFORD BANK.

Hopkins University, and in the *Johns Hopkins University Circular*, from 1880 on, naturalists working at Beaufort will find many papers and notes of faunistic interest, in which new forms are described or known ones recorded. Among these may be mentioned Professor Brooks's papers on "Medusæ" (*Studies*, 1882, 1883); and the lists and notes by Professors McMurrich (Actiniæ), Osborne (Mollusca), Nachtrieb (echinoderms), Jenkins (fishes), collected together under the title "Notes on the Fauna of Beaufort, N. C." (*Studies*, 1887). A great many facts of general natural history interest (systematic, distributional, ecological) will also be found scattered through the pages of the morphological and embryological memoirs which have been appearing since 1880 as the result of the work of Professor Brooks and his students at Beaufort.

At the laboratory of the U. S. Fish Commission, which was maintained during the past summer at Beaufort, the various species observed were recorded, and specimens preserved for the museum collection of the laboratory. It is planned that the record of each species shall include mention of the localities in which it is fairly abundant, most convenient collecting methods, time of year during which breeding goes on, brief natural history notes on habits of adult (food, enemies, parasites, rate of growth, time and extent of migration, etc.) and on the life history (character of eggs, where and how deposited, possibility of artificial fertilization, period of embryonic development, character of larva and period of larval development, habitat, food and enemies of larva). The economic value of such a knowledge of the natural history of the region will be readily understood, and it is equally obvious to what an extent it will aid naturalists engaged in the study of the abstruse problems of morphological and physiological embryology, of comparative anatomy and physiology. Its value in connection with similar results of the work at other coast stations, to the study of the variability of organisms, may be here alluded to.

To carry out such a scheme of work for a rich fauna like that of Beaufort will require years. An excellent basis has, however, been built up, and profitable lines of study marked out by the members of the Johns Hopkins Marine Laboratory and by other naturalists. During the past season's work (1899) of the Fish Commission Laboratory many of the previously known facts, some recorded, some unrecorded (in the possession of former workers at Beaufort), have been brought together and confirmed, and important additions have been made. The forms actually collected during the season included 238 species of marine invertebrates, some 70 fishes, 50 birds, a number of reptiles, amphibia, insects and arachnoids, and a very considerable number of land plants and algæ. In the case of a good number of species, notes along the lines indicated above were made. In gathering the data of the record all members of the laboratory lent their assistance, during such time as they were able to spare from their special investigations. I would especially thank Professors W. K. Brooks, E. W. Berger, J. Y. Graham, J. I. Hamaker, T. G. Pearson, Dr. D. S. Johnson, Dr. G. A. Drew, and Dr. Caswell Grave. Identifications and notes on breeding times have also been very kindly contributed by Professors E. A. Andrews, C. B. Davenport, J. S. Kingsley, George Lefevre, M. M. Metcalf, J. P. McMurrich, E. B. Wilson. In another season's work, doubtless, all the recorded forms will have been taken and identified. Further progress can only be made by a formal division of labor among the members of the laboratory. With the great awakening of interest, which is so apparent to-day, in the phenomena exhibited by animals and plants regarded as living units, it should not be difficult to find naturalists who will gladly work up the local natural history of the groups embracing the particular forms on which they may be investigating problems of a morphological or physiological character.

From among the forms occurring at Beaufort the following common summer ones may be selected with the purpose of giving a conspectus of the local fauna and flora. The months given immediately after the name of each species are breeding months, but it is not implied that breeding is limited to these months. In many forms breeding undoubtedly continues through a large part of the year — oyster eggs, for instance, have been fertilized in December by Dr. Caswell Grave. With a few exceptions the forms listed were noted during the past season. The exceptions include forms recorded by myself in 1886, 1894, 1898.

Protozoa. — *Noctiluca miliaris* and Acanthometra *sp.* are abundant in the tow throughout summer.

Sponges. — *Chalina arbuscula*, *Microciona prolifera*, *Cliona sulphurea*, and several other monactinellid sponges are common. No eggs nor gemmules have been observed during the earlier summer months, but by September 1st a number of species are breeding.

Cœlenterates.

Hydrozoa. — Hydroids: *Hydractinia echinata*, with gonophores, June; *Eudendrium ramosum*, with gonophores, June; *Sertularia carolinensis* (*sp.* ?), with gonothecæ, June; *Aglaophenia trifida;* Campanularia *sp.; Parypha cristata*, with gonophores, June, July. Hydromedusæ: *Liriope scutigera*, July, August; *Nemopsis bachei*, July, August; *Cunoctantha octonaria*, adults and parasitic larvæ, July, August; Cunina *sp.*, parasitic larvæ in Liriope, August; *Turritopsis nutricula*, July, August; *Margelis carolinensis; Eutima mira.* Siphonophores: Diphyes *sp.*, *Physalia arethusa*, *Porpita linnæana.*

Scyphomedusæ. — *Stomolophus meleagris*, *Chiropsalmus quadrumanus*, *Dactylometra quinquecirra*, *Cyanea versicolor* (*sp.* ?). Ephyra larvæ (*sp.* ?), common in tow, July, August.

Actiniaria and Madreporaria. — *Paractis rapiformis*, *Aulactinia capitata*, *Adamsia sol*, *Aiptasia pallida*, *Cerianthus americanus*, *Astrangia danæ*, Oculina *sp.* Arachnactis larvæ, in tow, August.

Alcyonaria. — *Renilla reniformis*, May, June, July; *Leptogorgia virgulata*, May, June, July; *Rhipidogorgia flabellum.*

Ctenophora. — *Mnemiopsis gardeni.*

Echinoderms. — Starfishes: *Asterias arenicola*, April; *Luidia clathrata*, August; *Astropecten articulatus*, August; large bipinnarias with budding starfish in tow, July. Ophiuroids: Amphiura *sp.*, June, larva a pluteus (species dredged three to nine fathoms, outside inlet); *Ophiura brevispina*, July, August, eggs discharged shortly after nightfall; *Ophiothrix angulata* (*sp.* ?), June, July; *Ophiolepis elegans*, nine fathoms, outside inlet, eggs nearly mature July 12. Echinoids: *Arbacia punctulata*, June, July; *Toxopneustes variegatus*, June, July; *Moira atropos*, August; *Mellita testudinata*, early September. Holothurians: Thyone briareus; *Leptosynapta girardii* (*sp.* ?), with apparently mature eggs, July; small synaptas abundant in night tow, August.

Worms. — Annelids: *Amphitrite ornata*, June; *Petaloproctus socialis;* Notomastus *sp.*; *Marphysa sanguinea; Diopatra cuprea; D. magna*, egg mass containing larvæ, July; *Nereis limbata*, September; *Hydroides dianthus*, July; *Harmothoe aculeata; Axiothea mucosa*, June, July; *Arabella opalina; Loimia turgida; Arenicola cristata*, June to August; *Sabella microphthalma; Pectinaria gouldii; Sabellaria vulgaris*, July; *Autolytus cornutus*, August, September (in tow); *Procerœa ornata; P. tardigrada*, early September (night tow); *Rhyncobolus americanus; Chœtopterus pergamentaceus*, June to August; *Sthenalais picta*. The interesting pelagic form, *Amphinome pallasii* (one of the *Blake* species), appeared in the harbor July 18; eggs and sperm were freely discharged. Other "worms": *Bdelloura candida*, June; *Meckelia rosea* (*sp.* ?); *Cerebratulus ingens;* Sagitta *sp.*, June to September; *Thalassema mellita*, June; *Balanoglossus brooksii, B. kowalevskii* (*sp.* ?). Professor Andrews in 1885 discovered the presence of the interesting form Phoronis (*P. architecta* Andr.). Actinotrocha larvæ are common in the tow during summer.

Mollusca. — In Stimpson's list (*loc. cit.*, 1860) 174 mollusks are recorded. Coues and Yarrow (*loc. cit.*) again list most of these and record a few others. Osborn (*loc. cit.*) records still others. The following may be mentioned:

Lamellibranchs: *Venus rugosa* (*sp.* ?) June, the burrowing form *Lithodomus lithophagus, Cytherea gigantea, Dosinia discus, Moctra solidissima, Tagelus gibbus, T. divisus, Modiola plicatula*, Pholas *sp.* (small species found in rotten wood; shells of *P. costata* common), *Solenomya velum, Anomia glabra, Arca transversa, A. ponderosa, A. pexata, Cyclas dentata, Cardium magnum, Pecten dislocatus, Donax fossor, Tellina alternata, Ostrea virginiana, Xylotria fimbriata* (and other shipworms) August, *Pinna semi-nuda*, Lima *sp.*, *Venus mercenaria, Rocellaria stimpsoni.*

Gastropods. — *Fulgur carica,* June, July; *F. canaliculata; Neverita duplicata,* June, July; *Sigaretus perspectivus; Purpura hæmastoma,* eggs deposited in confinement, July; *Strombus alatus; Fasciolaria tulipa,* June, July; *Crepidula fornicata,* June; *C. plana,* June; *Ilyonassa obsoleta; Urosalpinx cinerea,* June; *Oliva literata; Ovulum uniplicatum; Fissurella alternata; Littorina irrorata; Chætopleura apiculata.*

Among the opisthobranchs, species of Aphysia, Æolis, Doris, Polycera, Scyllæa (on gulf weed), Ancula, occur. Among the pteropods, *Styliola vitrea* is occasionally abundant. Among the cephalopods, *Loligo pealii* is rarely taken, and a form of lighter color (*sp.* ?) more commonly. Squid eggs are frequently dredged during summer, outside the inlet.

Crustacea. — As has been mentioned, something over sixty decapods are recorded for the locality. Beaufort is far enough to the south for the crab fauna, in particular, to show something of that variety, which becomes so pronounced in the tropics.

Decapods. — *Panopeus herbstii,* June, July; *Lupa sayi,* July; *Sesarma reticulata; Menippe mercenaria* ("stone crab"); *Callinectes hastatus,* June; *Ocypoda arenaria; Libinia canaliculata; Hepatus decorus; Gelasimus pugnax; Persephona punctata,* September; *Platyonichus ocellatus; Porcellana ocellata,* September; *P. macrocheles,* July, August (commensal in Chætopterus tubes); *Pinnotheres ostreum; Pinnixa chætopterana,* August (a rarer commensal in Chætopterus tubes); *Hippa emerita; Eupagurus vittatus,* June; *E. longicarpus; E. pollicaris; Penæus setiferus* (sold during latter part of August and September); *Palæmonetes vulgaris,* July; *Alpheus heterochelis,* July to September; *Alpheus minus,* September; *Gebia affinis,* June; *Tozeuma carolinensis,* August; Lucifer *sp.*, summer. The taking of the curious "false hermit" (*Hypoconcha arcuata*) may be referred to—the form has been recorded by Stimpson from South Carolina.

Among the forms belonging to other groups of Crustacea may be mentioned: *Squilla empusa, Lysiosquilla excavatrix,* Diastylis *sp.* (this cumacean is regularly taken in the night tow throughout summer); a large isopod (Ligia *sp.*), very abundant on wharves; an isopod (Gyge *sp.*), parasitic in branchial cavity of *Alpheus heterochelis;* another parasitic isopod (*Livoneca ovalis*, with embryos in August), common on gills of pinfish; Orchestia *sp.*; Caprella *sp.*, June. Numerous copepods and cladocera, many with eggs or embryos, are constantly taken in the tow throughout summer.

Among the cirripeds may be mentioned the common rock barnacle and ivory barnacle (*Balanus eburneus*), *Lepas anatifera*, which frequently appears in the harbor; a small Lepadide (Dichelaspis *sp.*), a common parasitic form on the gills of the edible crab, with abundant eggs in July, — this interesting form is probably the species mentioned by Fritz Müller (*Facts for Darwin*, p. 137) as occurring at Desterro on same crab (*Lupa diacantha*), — it differs in specific points from the several other members of the genus, described by Darwin and Hoek (*Challenger* Report). Limulus is of course abundant, young specimens swarming on the sand shoals in early summer (June). The eggs of Limulus were, as far as I know, for the first time artificially fertilized in 1882 by Professor H. L. Osborn at Professor Brooks's laboratory here.

Naturally but little attention has been paid to the tracheate arthropods — enough though to show that the locality is an excellent one for these groups. A few characteristic forms are: the slender, long-legged myriapod *Cermatia forceps*, sphinx moth, *Phlegethontius carolina* (larva, "tomato-worm," excellent for anatomical work and for metamorphosis), rhinoceros beetle, *Dynastes tityrus*. One of the large hunting spiders, Lysosa *sp.* (carrying cocoon in early September), is abundant. The cow-killer ant (burrowing mutillid wasp, female wingless), *Sphærophthalma sp.*, is a common form.

The polyzoa have not been studied. The common forms are species of Vesicularia, Bugula, Membranipora, Escharella, Pedicellina (species with spines, probably *P. echinata*). The only brachiopod known here, *Lingula pyramidata*, and its larva have already been spoken of. The particular locality in the harbor (first mentioned by Coues, *loc. cit.*) where Lingula, associated with Renilla and Amphioxus, was extremely abundant some years ago, has been encroached upon by a growing shoal and is no longer a good collecting place. Some equally good spots may in time be located.

The tunicates, too, are badly in need of systematic work. A large ascidian, Styela *sp.* (doubtless the *Cynthia vittata* of Stimpson's list), two to three inches high, is extremely abundant on the sand shoals and wharf piles. Another large and translucent form, Ascidia *sp.*, is fairly abundant on wharf piles and old shells, breeding in May and June. *Molgula manhattensis*, *Perophora viridis* (breeding in June and July), Amarœcium *sp.* are common species. Appendicularia *sp.* is a common form in the tow throughout summer — Professor George Lefevre has found it breeding from April to August. Doliolum *sp.* is occasionally taken in the harbor through the summer — both the nurse with stolon and buds, and the sexual form with ripe eggs.

The variety of fishes that may be taken in a short time in Beaufort harbor and adjoining waters is so great as to make it evident that the number recorded (Jenkins, *loc. cit.*, gives 134) for the region will be greatly increased when systematic collecting has been carried on for a few years. Some nine miles from Beaufort inlet the coast line makes a sharp, right-angled bend, with Cape Lookout at the angle. From the end of the cape a narrow line of shoals extends much farther out. The cape and its submerged continuation form a wall, as it were, reaching seaward for fifteen miles. Cape Lookout itself is so shaped as to embrace a bay, a quiet and beautiful sheet of water, Lookout Bight. The coast configuration thus forms a remarkable natural trap into which fish, migrating northwards, fall. It is doubtful whether a better place can be found anywhere on our coast for the carrying out of observations on oceanic species and on bay and river species during the oceanic period of their life. The seining that has been carried on at Cape Lookout has been extremely interesting and successful, both as regards the variety of forms and the number of individuals taken.

The following species may be mentioned from the harbor and adjacent waters: Amphioxus is found, but is not common — the pelagic larvæ are taken in the tow (July). The commonest sharks are the "sharp-nosed," *Carcharinus terræ-novæ*, "shovel-headed," *Sphyrna tiburo.* Young "hammerheads," *Sphyrna zygæna*, are very abundant in the early summer in some years. The sawfish, *Pristis pectinatus*, is frequently taken. The sting ray, *Trygon sayi*, and butterfly skate, *Pteroplatea maclura*, are abundant. Several eagle rays are occasionally taken (cow-nosed ray, *Rhinoptera quadriloba*, last summer), and the sea devil, *Manta birostris*, has been caught at Cape Lookout. Several cyprinodons (Fundulus, Cyprinodon, Gambusia) are abundant alongshore and in "salt ponds" — *F. heteroclitus*, with ripe eggs, July. Blennies are abundant about the wharf piles, *Hypleurochilus multifilis* depositing its eggs on sponges, etc., August. The toadfish, *Batrachus tau*, and its eggs (summer) are of course abundant. *Selene vomer* and some other "moonfishes," two halfbeaks (*Hemirhamphus braziliensis*, *H. unifasciatus*), the shark pilot, *Echeneis naucrates*, pipefish, *Siphostoma floridæ*, and *Hippocampus hudsonius*, *Nomeus gronovii* (in bell cavity of the rhizostomous medusa, Stomolophus), several swellfishes (*Logocephalus lævigatus*, *Chilomycterus geometricus*, *Tetrodon turgidus*) may be referred to. The commonest summer food fishes are the bluefish, Spanish mackerel, sheepshead, jumping mullet, sea mullet, hogfish (*Orthopristis chrysopterus*), pinfish (*Diplodus rhomboides*), croaker, spot, porgee, weakfishes (local "trouts," *Cynoscion regale*, *C. maculatum*), "blackfish" (*Serranus atrarius*), a number of flounders (flounder spearing with a torch of "fat" pine is a common occupation on summer nights). The menhaden (local "fatback") fishery is an important industry. Some attention was paid during the past season to the breeding condition of the edible species, and June would seem to be a good month for fish-cultural work — the hogfish, porgee, and sea mullet are breeding at that time.

Birds. — The laboratory is indebted to Professor T. G. Pearson, of Guilford College, for the identification of some fifty summer birds. Gulls and terns are uncommon in the harbor. In the salt marshes several herons are abundant, also the clapper rail and the marsh wren (Worthington's), the interesting false nests of which are easily found. The Florida cormorant is frequently seen flying across the harbor. Characteristic shorebirds are the black-bellied plover, oyster catcher, willet, spotted sandpiper, yellow legs. Other characteristic birds seen about the harbor are the fish crow and boat-tailed grackle. In the town, and in the woods back of the town, and on the banks, many species are found which are common in the central part of the state (mourning dove, flicker, kingbird, crested flycatcher, phœbe, towhee, cardinal, mocking bird, brown thrasher, titmouse, Carolina chickadee). In the winter there is said to be good duck shooting in the neighborhood of the town.

Other Vertebrates. — A number of lizards are abundant in and back of the town (*Anolis carolinensis*, *Eumeces fasciatus*, *Cnemidophorus sexlineatus*, *Sceloporus undulatus*). Alligators are said to be common in localities close to Beaufort, especially in White Oak River, opening into Bogue Sound. Specimens are occasionally brought into Beaufort. The bank ponies quickly attract the attention of the newcomer. They run wild on the banks and adjacent parts of the mainland, and are periodically corralled ("penned") for branding and sale. The ponies are fond of the salt-marsh grass, and droves may, on almost any day, be seen wading or swimming between the shore and the marsh islands. Deer are fairly abundant in localities, both on mainland and banks. Other common mammals are the mink, raccoon, opossum. Coues (*loc. cit.*) says the "marsh hare" (*Lepus palustris*) is "the most abundant and characteristic mammal" on Bogue bank. Porpoises are frequently seen in the harbor; the pairing season, according to Coues, is in April and May.

Dr. D. S. Johnson and Mr. W. C. Coker, of Johns Hopkins University, made, during the past season, a reconnaissance of the flora of the region, the results of which Dr. Johnson has embodied in two papers (on the flora of the banks, and the algæ of the harbor), which will appear in the Fish Commission publications. Dr. Johnson describes the peculiar physiographic characteristics of the banks, which (I quote from his unpublished paper) "vary in width from a quarter of a mile to a mile and a half, and in height from nearly sea-level, in the case of certain fresh water and salt marshes, to a maximum height of perhaps forty feet in the case of some of the wind-blown dunes. The conditions prevailing on the higher parts of these banks are quite peculiar, in that while the shifting sandy soil holds very little water, yet the air is very damp, since during the growing season the prevailing wind is a strong sea breeze saturated with moisture. Thus are to be explained, perhaps, the frequent occurrence in this very dry soil of many plants which usually occupy a much damper soil, and the striking abundance of epiphytic lichens, liverworts, mosses, and ferns." While the algal flora is not so varied as on more rocky parts of the coast, a very considerable number of species are present in abundance. Among these may be mentioned *Hypnea musciformis*, *Ulva lactuca*, *Dictyota dichotoma*, *Rhabdonia tenera*, *Gracilaria confervoides*, *Codium tomentosum*, *Padina pavonia*, *Sargassum vulgare*, *Dasya elegans*, *Melobesia pustulata*, and species of Callithamnion, Ectocarpus, Enteromorpha, and Polysiphonia.

With its rich and accessible fauna it is not to be wondered at that Beaufort should have been so attractive to naturalists. Among those who carried on investigations in this locality before 1880 may be mentioned Professor Louis Agassiz, Dr. Stimpson, Dr. Gill, Dr. Coues, Dr. Yarrow, President Jordan, Professor Morse, Professor Packard, Professor Webster. In 1880 the marine laboratory of the Johns Hopkins University, which during the previous two years had been located at points in the Chesapeake Bay, was stationed here. A large house near the extreme eastern end of the town was rented continuously, and an excellent equipment, including a 47-foot sloop and a steam launch, was provided. Professor Brooks, with his students and co-workers, continued their investigations year after year at Beaufort (with the exception of 1883, when the laboratory was stationed at Hampton, Va.) until 1886, when they spent the summer in the Bahama Islands. During most of the years since that time the Johns Hopkins laboratory has been stationed in the Bahamas or in Jamaica, with returns to Beaufort at intervals. The important share which this laboratory has had, since its inauguration in 1878 at Fort Wool, in determining the character of zoölogical study in America is well known. A list of its members will be found to include many of the leaders in this branch of science in the several parts of the country, and the number of memoirs and papers based on observations made during its sessions is very large.

During the last few years there have been in Beaufort, from time to time, parties of naturalists from Columbia (under Professor E. B. Wilson) and other universities, as well as from the Johns Hopkins. The U. S. Fish Commission has for years been familiar with the fact that Beaufort presented many opportunities for the scientific study of economic problems. The large number of edible fish and Crustacea, the extensive beds of clams and oysters, make the region one of commercial importance. At Professor Brooks's laboratory many contributions to the life histories of edible forms (shrimps, crabs, fish, oyster) were made. As a continuation, along economic lines, of Professor Brooks's discoveries concerning the development of the American oyster, Lieutenant Winslow's experiments on the artificial propagation of oysters may be mentioned. Professor Brooks, Lieutenant Winslow, Professor H. L. Osborn have all pointed out what an abundant "set" of spat may be had, and how rapidly the spat grows. An extensive survey of the oyster grounds of North Carolina was carried out some years ago, under the direction of Lieutenant Winslow;[1] and the U. S. Fish Commission, conjointly with the director of the Geological and Natural History Survey of North Carolina, Professor J. A. Holmes, has had in progress since last September a reëxamination of a part of the ground, with especial reference to the present condition of planted beds. As an outcome of this work we may expect to have, in the near neighborhood of Beaufort, a carefully planned and conducted experimental oyster farm, on which a continuous series of observations may be carried out for some years, with the sure expectation that improvements in oyster culture will result.

---

[1] Winslow, Lieutenant Francis. Report on the Waters of North Carolina, with reference to their possibilities for oyster culture, *State Printer*. Raleigh, 1886; Report on the Sounds and Estuaries of North Carolina, with reference to oyster culture, *U. S. Coast and Geodetic Survey, Bulletin No. 10*, 1889.

A year ago the director of the Geological Natural History Survey of North Carolina represented to the U. S. Commissioner of Fish and Fisheries, Hon. George M. Bowers, how desirable it was for the material development of the marine fisheries that some step be taken toward providing a headquarters, where continuous observations might be made on the natural history of the fauna of the south Atlantic coast, and how suitable the town of Beaufort was for such a purpose. In May Dr. H. M. Smith, in charge of the Division of Scientific Inquiry, announced (*Science*, Vol. IX, No. 227) the decision of the Commission to maintain, during the summer, at Beaufort, a laboratory for the prosecution of researches in marine biology. A suitable building was rented, and a proper equipment, including small boats, steam launch, dredges, trawl, etc., was provided. The laboratory was occupied from June 1 to September 15. A dozen naturalists were there, representing the Johns Hopkins University, University of Alabama, Baldwin University, Trinity College (N. C.), Guilford College, University of North Carolina. Mention has already been made of the fact that, in addition to the individual research work, considerable attention was paid to the accumulation of data on the local habitat, breeding times, etc., of the more abundant species of the region. The laboratory building is rented continuously, and the equipment and collections are stored there. The laboratory will reopen for work in June. As at Woods Holl, no charge is made to the occupants of tables.

While the temporary laboratory now organized at Beaufort answers many needs, it is greatly to be desired that a permanent Fish Commission station be established there. A bill providing the necessary appropriation for such a station is now before Congress. The policy of maintaining Fish Commission stations, at which ample opportunity is offered for scientific investigation, has been fully justified by the history of the station at Woods Holl. The results of the purely voluntary researches of the naturalists who have annually visited this station are of the highest value. In no way can the Fish Commission accumulate useful information concerning the animal and plant life of a region, so rapidly and at so little expense, as by maintaining a well-equipped laboratory, open to all who come to study the natural history of that region. Professor Alexander Agassiz, in his report on the Museum of Comparative Zoölogy for the year 1894–95, points out the mutual advantages that result from coöperation between the Fish Commission and those engaged in research work in biology. Mr. Agassiz has especially in mind the Woods Holl station, but his remarks have a wider applicability. Mr. Agassiz remarks that "no university laboratory can hope to obtain the facilities accruing from the maintenance of the fleet of small boats and steamers, and of the personnel which forms a necessary part of the equipment of the Fish Commission Station"; and farther on: "The mere collecting of material for ordinary investigation, at a marine station, is not expensive, but it is expensive to carry on the continuous observations of eminent specialists, and subsequently to publish their investigations. *Such observations could well be carried on in connection with the work of a Government Fish Commission, and are not only germane to its investigations, but all important to their success.*"[1]

The bill providing for a marine station at Beaufort has the earnest support of many naturalists and college presidents in the North, West, and South. It is widely recognized how advisable, both from the scientific and economic standpoint, it is to have several stations along our coast at which observations may be carried on year after year. The wisdom of such a course becomes manifest when we consider the length of the coast, the difference in the character of its fauna at widely separated places, and the migratory habits of many animals (food fishes, etc.). It may safely be said that many of the most interesting economic problems, such, for instance, as the effect of the feeding ground on edible animals, and the possibility of altering such grounds, can only be solved after a comparison of results, obtained at various points on the coast, has been made, and the same is true for the broader study of variation in its strictly scientific aspect.

University of North Carolina.

---

[1] Italics are mine.